REMARKS

Claims 24-34 as amended, remain herein.

Applicants' undersigned attorney thanks Examiner Chang for the courtesies extended during the interview conducted on September 6, 2002, a record of which is stated in the Interview Summary of that date.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached pages are captioned "Version with Markings to Show Changes Made".

Claims 24-26 and 29-31 have been amended more clearly to recite applicants' invention. Claims 24 and 29 have been amended to include the step of modifying the protrusions to have substantially equal heights. See applicants' specification, page 8, lines 28-30, describing the additional step of leveling out the heights of protrusions 3 shown in Fig. 4.

Claims 24 and 29 also have been amended to recite a plurality of wiring patterns each extending across a surface of an insulating substrate for connecting at least two locations on the substrate. See applicants' specification, page 6, lines 9-13, describing Fig. 1.

This Amendment places all claims 24-34 in condition for allowance, and surely in better condition for any appeal. Thus, entry of this Amendment and allowance of all claims 24-34 are respectfully requested.

1. The title has been replaced with: "Method of Manufacturing a Circuit Board Having Simultaneously and Unitarily Formed Wiring Patterns and Protrusions."

2. Objections were stated to claims 25, 26, 30 and 31. Each informality has been amended, thereby mooting those objections.

3. Claim 26 was rejected under 35 U.S.C. §112, second paragraph. Claim 26 has been amended to replace "board" with "substrate".

Reconsideration and withdrawal of this rejection are respectfully requested.

4. Claims 24-26 and 29-31 were rejected under 35 U.S.C. §103(a) over Mohri et al. U.S. Patent 6,132,543 and Covell II et al. U.S. Patent 5,718,367.

Claims 24 and 29 of the presently claimed method of manufacturing a circuit board recite (1) simultaneously and unitarily forming a plurality of wiring patterns and protrusions, and (2) modifying the protrusions to have substantially equal heights, wherein the plurality of wiring patterns each extends across a surface of an insulating substrate for connecting at least two locations on the substrate. This method is not taught or suggested in Mohri '543 or Covell '367.

Mohri '543 is cited for allegedly disclosing wiring patterns on a circuit board and for coupling the circuit board to a semiconductor chip.

Covell '367 is cited for allegedly disclosing simultaneously and unitarily forming protrusions 72 and wiring patterns 71. Actually, Covell '367, column 6, line 35, describes cast solder pillar 70 having a column-like body 72 with broadened head 71. However, Covell '367 does not describe such a pillar 70 for extending across a surface of an insulating substrate for

connecting at least two locations on the substrate, as recited in applicants' claims 24 and 29.

Instead, each pillar 70 connects a single location on a circuit board with a pad on a semiconductor device, which is a simple point-to-point connection between one point on the board and one point on the semiconductor device. See Covell '367, column 5, 59-64, describing cast solder 41 for being attached between a board and a carrier 95, such as a semiconductor device, as shown in Covell '367 Fig. 4. Accordingly, Covell '367 does not describe pillar 70 for extending across a surface of an insulating substrate for connecting at least two locations on the substrate, as required by applicants' claims. Pillars 70 physically cannot connect more than one location on the substrate to one location on a carrier.

Covell '367 does not teach or suggest, after the step of forming the wiring patterns and the protrusions, the step of modifying the protrusions to have substantially equal heights. Such modification is for effective electrical connection between the semiconductor and circuit board. See applicants' specification, page 8, lines 29-30. Covell '367 does not teach or suggest the desirability or any benefit of modifying the protrusions to have

substantially equal heights. Instead, Covell '367 directly uses whatever heights are obtained by solder casting, and at column 7, lines 6-14, and teaches attaching such solder casting, as is, to a carrier, such as a semiconductor device, as shown in Covell '367, Fig. 4. Covell '367 does not teach or suggest any need for any step of leveling the heights of the protrusions, as recited in applicants' claims.

In addition, claims 24 and 29 recite transferring the sintering conductive material to the substrate before the material is sintered, i.e., applicants' presently claimed invention cold-molds the conductive material and then transfers that cold-molded material to the substrate. The conductive material is heated to sintering temperatures after being transferred to the substrate. In contrast, Covell '367 melts the solder in the mold, before transferring the resulting molded cast solder pillar to the substrate or semiconductor device. This application of heat for melting prior to removal from the mold is completely different from applicants' presently claimed invention, wherein the conductive material is molded cold, transferred cold, and then heated to a sintering temperature while located on the substrate.

Accordingly, for all three of the above reasons, Mohri '543 and Covell '367 do not teach or suggest all of the limitations of applicants' claims 24 and 29.

Applicants' claims 25 and 30 recite wiring patterns and protrusions made of a same conductive sintered material. Claims 25 and 30, which depend from claims 24 and 29, respectively, are patentable for the reasons described herein for claims 24 and 29.

Claims 26 and 31, which depend from claims 24 and 29, respectively, are patentable for the reasons described herein for claims 24 and 29.

For the foregoing reasons, neither Mohri '543 nor Covell '367 contains any teaching, suggestion, reason, motivation or incentive that would have led one of ordinary skill in the art to applicants' claimed invention. Nor is there any disclosure or teaching in either of these references which would have suggested the desirability of combining any portions thereof effectively to anticipate or suggest applicants' presently claimed invention. Claims 27 and 28, which depend from claim 26, are allowable for the same reasons as claim 26, and claims 33 and 34, which depend from claim 32, are allowable for the same reasons as claim 32.

Accordingly, reconsideration and withdrawal of this rejection are respectfully requested.

All claims 24-34 are now proper in form and patentably distinguished over all grounds of rejection cited in the Office Action. Accordingly, allowance of all claims 24-34 is respectfully requested.

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Should the Examiner deem that any further action by the applicants would be desirable to place this application in even better condition for issue, the Examiner is requested to telephone applicants' undersigned representatives.

Respectfully submitted,

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October 7, 2002
Date

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RWP:RNW/mhs

Attachment: Version with Markings to Show Changes Made
Petition for Two-Month Extension of Time

Attorney Docket No.: MEIC:053A

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

24. (Twice amended) A method of manufacturing a circuit board comprising a plurality of wiring patterns each extending across a surface of an insulating substrate for connecting at least two locations on the substrate, and a plurality of protrusions located at desired locations on the wiring patterns, [on a substrate, wherein said method comprises] comprising:

simultaneously and unitarily forming the wiring patterns and the protrusions, and

modifying the protrusions to have substantially equal heights.

25. (Amended) The method of manufacturing [a] the circuit board as defined in Claim 24, wherein the wiring patterns and the protrusions are made of a same conductive sintered material.

26. (Twice amended) The method of manufacturing [a] the circuit board as defined in Claim 25 [further comprising], wherein forming the wiring patterns and the protrusions of the same conductive sintered material comprises:

forming a first groove on a film, the first groove having a bottom surface;

forming a second groove at a predetermined location in the first groove;

filling sintering conductive material into the first and the second grooves;

transferring the filled sintering conductive material [to] onto the [board] substrate; and

[firing] sintering the transferred conductive material.

29. (Twice Amended) A method of manufacturing a semiconductor device comprising the steps of:

[(a)] simultaneously and unitarily forming a first plurality of wiring patterns and a second plurality of protrusions [disposed] located at desired locations on the wiring patterns on a [board] an insulating substrate, the protrusions having substantially equal heights, the wiring patterns each extending across a surface of the substrate for connecting at least two locations on the substrate; [and]

modifying the protrusions to have substantially equal heights; and

[(b)] coupling electrically the protrusions [and] to electrodes [disposed] located on a semiconductor chip component.

30. (Amended) The method of manufacturing [a] the semiconductor device as defined in Claim 29, wherein the wiring patterns and the protrusions are made of a same conductive sintered material.

31. (Twice Amended) The method of manufacturing [a] the semiconductor device as defined in Claim 30, wherein forming the wiring patterns and the protrusions of the same conductive material comprises:

forming a first groove on a film, the first groove having a bottom surface;

forming a second groove at a predetermined location in the first groove;

filling sintering conductive material into the first and the second grooves;

transferring the filled sintering conductive material onto the [circuit board] substrate; and

[firing] sintering the transferred conductive material.